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Exploration of fungicides and phytoextract against *Fusarium Oxysporum* f. sp. *Gladioli* causing corm rot of gladiolus

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ABSTRACT

All the fungicides tested *in vitro* were found effective in inhibiting the mycelial growth of *Fusarium oxysporum* f. sp. *gladioli*. Difenconazole (0.1%) and Propiconazole (0.1%) completely inhibited the mycelial growth of *Fusarium oxysporum* f. sp. *gladioli* followed by Thirum (85.22%), Captan (82.77%), Carbendazim (65.33%) and Copper oxychloride (50.77%). Least inhibition of the test fungus was recorded due to Mancozeb (32.00%) and Thiophenate methyl (28.66%). Among the different plant extract tested against the same fungus, complete inhibition of mycelial growth was achieved due to 10 per cent *Jatropha* followed by Soapnut (37.00%), Neem seed kernel extract (35.00%), Cassia (26.44%), Neem leaf extract (22.00%), bulb extract of Garlic (17.22%). Clove, Castor, Nilgiri, Cinnamon and Sarpagandha were found least effective against the fungus.

Key words: *Gladiolus*, *Fusarium oxysporum*, fungicides, phytoextracts, inhibition.

Abbreviations: NSKE - Neem seed karnel extract.

1. INTRODUCTION

Gladiolus is a very popular bulbous ornamental plant. Its magnificent inflorescence with florets of dazzling colours, varying forms and sizes and long keeping quality makes it an attractive cut flower. Gladiolus spikes can be kept in the vases for 8-10 days depending on the variety and the ambient conditions prevailing in the room. Gladiolus is an essential component of most flower arrangements including bouquets. It is being grown in an area of 11660 ha in the country with an estimated production of 106 crore cut flowers. Amongst the cut flowers, gladiolus occupied third position in terms of both area and production. The major gladiolus producing states in the country are Uttar Pradesh, West Bengal, Orissa, Chhattisgarh, Haryana, Maharashtra, Uttarakhand, Karnataka, Andhra Pradesh and Sikkim (Anonymous, 2012).

Among the various diseases of gladiolus, corm rot caused by *Fusarium oxysporum f. sp. gladioli* is one of the most destructive diseases, commonly prevailing in almost all gladiolus growing pockets of the world causing heavy loss. Corm rot disease was observed on gladiolus crop cultivated at farm of College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli as well as different greenhouses in Dapoli tahasil. The disease is now a days becoming major hurdle in successful cultivation of gladiolus. Keeping in view economic importance and yield losses caused by corm rot, the present investigations were undertaken.

2. MATERIAL AND METHODS

2.1. *In vitro* evaluation of fungicides against *Fusarium oxysporum f. sp. gladioli*

Eight different fungicides were tested against the test pathogen, applying Poisoned Food Technique (Nene and Thapliyal, 1983). Three replications per treatment were maintained. The observations for colony diameter and sporulation were recorded until whole of the plate in control treatment was fully covered with mycelial growth. Per cent inhibition of growth of the test fungus was calculated (Horsfall, 1956).

2.2. *In vitro* evaluation of phytoextracts against *Fusarium oxysporum f. sp. gladioli*

The aqueous plant extracts of neem (*Azadirachta indica*), nilgiri (*Eucalyptus globulus*), cinnamon (*Cinnamomum verum*), castor (*Ricinus communis*), clove (*Syzygium aromaticum*), cassia (*Cinnamomum aromaticum*), jatropha (*Jatropha curcas*), sarpagandha (*Rauvolfia Serpentina*), soapnut (*Sapendus tripholiarus*) and garlic (*Allium sativum*) were prepared as per the method described by Bhatti (1988).

The effect of plant extracts on mycelial growth was studied by 'Poisoned Food Technique' (Nene and Thapliyal, 1993). All the plant extracts were tested at 10 per cent concentration against the test pathogen using oat meal agar as a basal medium. The experiment was planned with CRD and all the treatments replicated thrice. The observations on colony diameter of the fungus were recorded when untreated control Petri plate was fully covered with mycelial growth and the per cent inhibition of the test fungus was calculated.

3. RESULTS

3.1. *In vitro* evaluation of fungicides against *Fusarium oxysporum f. sp. gladioli*

The data from Table 1 revealed that all the fungicides tested have significantly inhibited the mycelial growth of *Fusarium oxysporum f. sp. gladioli*. Difenconazole (0.1%) and Propiconazole (0.1%) showed complete inhibition of the test pathogen. These were followed by Thirum (0.2%), Captan (0.2%), Carbendazim (0.1%) and Copper oxychloride (0.25%) which showed 85.22, 82.77, 65.33 and 50.77 per cent inhibition of the test fungus over control, respectively. Least inhibition of the test fungus was recorded due to 0.2 per cent Mancozeb (0.2%) and Thiophenate methyl (0.1%) with 32.00 and 28.66 per cent inhibition of the fungus over control, respectively.

3.2. *In vitro* evaluation of phytoextracts against *Fusarium oxysporum f. sp. gladioli*

The aqueous extracts of eleven plant species were tested against the test fungus to exploit their antifungal properties. All the plant extracts were tested at 10 per cent concentration by using Poisoned Food Technique. All the plant extracts tested showed antifungal activity against *F. oxysporum*. The data presented in Table 2 revealed that the complete inhibition of *F. oxysporum f. sp. Gladioli* was achieved due to Jatropha and was significantly superior over rest of the treatments. Extracts of Soapnut, Neem seed kernel, Cassia leaf, Neem leaf, Garlic bulb and Clove exhibited 37.00, 35.00, 26.44, 22.00, 17.22 and 14.22 per cent inhibition of the test fungus over control, respectively.

4. DISCUSSION

4.1. *In vitro* evaluation of fungicides against *Fusarium oxysporum f. sp. gladioli*

The fungicides like Difenconazole (0.1%) and Propiconazole (0.1%) showed complete inhibition of the test pathogen, followed by Thirum (0.2%), Captan (0.2%), Carbendazim (0.1%) and Copper oxychloride (0.25%) which showed 85.22,

82.77, 65.33 and 50.77 per cent inhibition of the test fungus over control, respectively. The findings are in close conformity with earlier report of Mir *et al.* (2012) who found Carbendazim the most effective fungicide against *Fusarium oxysporum f. sp. gladioli* as well as other corm rot pathogens of saffron. Similarly, Skrzypczak (1990), Raja *et al.* (2004) and Mallesh *et al.* (2008) also reported the effectiveness of Carbendazim and Captan against different species of *Fusarium*.

4.2. In vitro evaluation of phytoextracts against *Fusarium oxysporum f. sp. gladioli*

The complete inhibition of pathogen was achieved due to Jatropa and was significantly superior over rest of the treatments. Extracts of Soapnut, Neem seed kernel, Cassia leaf, Neem leaf, Garlic bulb and Clove exhibited 37.00, 35.00, 26.44, 22.00, 17.22 and 14.22 per cent inhibition of the test fungus over control, respectively. According to Sobia *et al.* (2011) *Azadirachta indica* showed maximum growth inhibition of *Fusarium oxysporum f. sp. gladioli* followed by *T. erecta* and *Allium sativum*. The findings are also in close conformity with those of Mallesh *et al.* (2008) and Tariq *et al.* (2010). Castor and Nilgiri showed 12.55 and 12.44 per cent inhibition over control, respectively and were at par with each other. The leaf extract of Cinnamon and Sarpagandha were found to be least effective in inhibiting the mycelial growth of the test pathogen which recorded only 11.11 and 10.33 per cent inhibition over control. Chandel and Tomar (2007) also reported the antifungal activity of different phytoextracts against corm rot and wilt causing *Fusarium oxysporum f. sp. gladioli* in gladiolus.

5. CONCLUSION

1. From the results it is concluded that Difenconazole (0.1%) and Propiconazole (0.1%) are found to be the most effective fungicides *in vitro* against *Fusarium oxysporum f. sp. gladioli* followed by Thirum (0.2%), Captan (0.2%), Carbendazim (0.1%) and Copper oxychloride (0.25%) which showed 85.22, 82.77, 65.33 and 50.77 per cent inhibition of pathogen.
2. Among different plant extracts Jatropa extract (100 % per cent inhibition over control) is emerged as most effective phytoextracts tested against *Fusarium oxysporum f. sp. gladioli* followed by extracts of Soapnut, Neem seed kernel and Cassia leaf.

SUMMARY OF RESEARCH

1. The incidence of disease was recorded on gladiolus crop cultivated at farm of College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli as well as different greenhouses in Dapoli tahasil of Maharashtra during 2011 to 2013.
2. Fungicides like Difenconazole, Propiconazole, Thirum, Captan and Carbendazim can be used for the management of pathogen.
3. Maximum per cent inhibition of pathogen was achieved with plant extracts such as Jatropa, Soapnut and Neem seed kernel.

DISCLOSURE STATEMENT

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Table 1

In vitro efficacy of fungicides on radial mycelial growth and inhibition of *Fusarium oxysporum* f. sp. *gladioli*

Tr. No.	Fungicides	Conc. (%)	Mean colony dia. (mm)	Per cent inhibition over control
T ₁	Difenconazole	0.1	00.00	100.00
T ₂	Thirum	0.2	13.30	85.22
T ₃	Thiophenate methyl	0.1	64.20	28.66
T ₄	Propiconazole	0.1	00.00	100.00
T ₅	Carbendazim	0.1	31.20	65.33
T ₆	Captan	0.2	15.50	82.77
T ₇	Mancozeb	0.2	61.20	32.00
T ₈	Copper oxychloride	0.25	44.30	50.77
T ₉	Control		90.00	-
	S.Em. ±		0.13	
	C.D. at 1%		0.54	

Table 2

Effect of plant extracts on growth of *Fusarium oxysporum* f. sp. *gladioli*

Tr. No.	Treatments	Conc. (%)	Mean colony diameter (mm)	Per cent inhibition over control
T ₁	Cinnamon (<i>Cinnamomum verum</i>)	10	80.00	11.11
T ₂	Jatropha (<i>Jatropha curcas</i>)	10	00.00	100.00
T ₃	Castor (<i>Ricinus communis</i>)	10	78.70	12.55
T ₄	Soapnut (<i>Sapendus tripholiarus</i>)	10	56.70	37.00
T ₅	Nilgiri (<i>Eucalyptus globulus</i>)	10	78.80	12.44
T ₆	Neem (<i>Azadirachta indica</i>)	10	70.20	22.00
T ₇	Neem (NSKE) (<i>Azadirachta indica</i>)	10	58.50	35.00
T ₈	Sarpagandha (<i>Rauvolfia Serpentina</i>)	10	80.70	10.33
T ₉	Garlic (<i>Allium sativum</i>)	10	74.50	17.22
T ₁₀	Clove (<i>Syzygium aromaticum</i>)	10	77.20	14.22
T ₁₁	Cassia (<i>Cinnamomum aromaticum</i>)	10	66.20	26.44
T ₁₂	Control	-	90.00	-
	S.Em. ±		0.15	
	C.D. at 1%		0.60	